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SOME BASIC CONCEPTS OF INDUSTRIAL TRAINING*

By N. F. MYERS†

Training in any organization has its roots in the underlying philosophy behind that company's policies.

In Esso, the company's employees are considered to be its greatest asset. Its philosophy can best be expressed in the recent annual report of the parent company, the Standard Oil Company (New Jersey), to its stockholders:

> "In the future, as in the past, the Company will put its chief reliance for growth and prosperity on the development of an exceptional personnel. Jersey feels its greatest asset today, as it faces the grave problems of a troubled world, is the high character and ability of its people. The Jersey form of decentralized organization" (of which Esso Petroleum is one part) "has the greatest merits of every democratic system, chief among them the stimulation it gives to the development of able, courageous, energetic, and self-reliant men and women."

The reputation of a company as an employer, as a refiner or as a marketer, depends to a large extent upon the impressions created among associates, customers, and future employees, by the attitudes, abilities, skills, and knowledge of employees. It is true that "a company is known by the men it keeps".

Company Policies

In any organization, the company's philosophy will be manifested in its clearly stated policies which set out the

*From a talk delivered to the Fawley Branch of the Institute, 17 October, 1951.

†Esso Petroleum Co. Ltd.

guiding principles within which its management, supervisors, and employees shape their daily actions.

Esso's philosophy finds expression in a number of policies which are well known to all employees:

1. It is intended to promote from within the company wherever possible.

In terms of training this means that it is aimed to equip and develop individuals for a career of company service in posts of ascending responsibility to the fullest extent of every employee's ability.

2. It is the policy to encourage employees to make their career within the company by offering steady employment at good wages under pleasant working conditions and with the assurance that provision is being made for their retirement. The Pension Plan has been acclaimed as an outstanding example of this policy. This means, and will increasingly mean, that many highly skilled employees and technicians will be found in the higher wage and older age brackets. In terms of training the intention will be to ensure that the specialized "know how" of older employees is transferred to the younger ones over the years.

3. It is the policy to encourage employees to round out their theoretical and professional knowledge by taking specialized courses outside of the company's organization. This is implemented through the Educational Refund Plan, which has already given financial assistance to a number of employees.

4. It is the intention to provide an efficient and effective programme for training. The best obtainable experience and advice in planning and directing the present training programme have already been acquired. The training section, within the Employee Relations Department, will continue to receive the fullest support of management in order that it may be deserving of whole-hearted co-operation from all employees.

Basic Concepts of Management

Management's basic job is a matter of "getting things done through people". With such an assignment, it is obvious that training is a fundamental part of management and will therefore be governed by the general principles of good management practice.

A number of basic management concepts relating to training follow:

Training is never a matter of choice. To perform any job satisfactorily a man must acquire an appropriate mixture of knowledge, skills, mental attitudes and working relations with others. He will acquire them in one way or another, either by chance or by planned training. The former is unplanned and uncontrolled learning, and there is no guarantee that it will be directed towards productive and effective objectives. There is no assurance under casual training that the employee will be supplied with the necessary knowledge and skill to allow him to do his job reasonably well and thus enjoy the personal satisfaction of a "job well done" and maintain his dignity among his fellow men. The chances are that unplanned training will be inadequate and inefficient. Well-organized and efficiently directed training programmes will always produce better results on the job and for the employee.

Training is the company's concern. In planning for industrial growth through individual development to qualify for advancement the company recognizes the need for management to take the initiative to ensure that qualified employees are available to fill vacancies.

Training is a line responsibility. In accordance with sound management practice of delegating responsibilities and adequate authority down the line, it is recognized to be the responsibility of each supervisor to provide for the training of those who work with him. No-one is in a better position than the

immediate supervisor to know the weak points of his employees, and to determine how to strengthen them. Training staff is available to assist and guide the supervisor by helping plan the training, and by providing adequate training services and equipment.

Training must be planned to meet existing and projected needs. Too much training can represent a waste, just as too little training will mean a loss. Training to be effective must be timed to be completed ahead, but only just ahead of the period when the acquired knowledges and skills will be utilized in the employee's work.

Training must be continuous. All too often training has been a matter of "putting out fires". Training needs may have been allowed to accumulate over a long period of time; elaborate training programmes may have been conducted to overcome them and then abandoned after those needs have been partially satisfied. Training is a means for preventing problems from arising rather than solving difficult problems after they have arisen. It is Esso management's intention to provide for continuous training.

The training programme must be acceptable to both supervisor or trainer and employee or trainee. Its objectives must be well understood by all. It must be based on good human relations, with fair and honest applications to all employees. It is not a one-sided programme designed only to stimulate production, but is planned to assist every man to know his present job so that he may best qualify for the next available promotion.

How Training is Planned

Within the framework of these basic concepts a procedure for planning and organizing training can be set out. Regardless of whether the training involves mechanics, process operators, office employees, technical personnel, supervisors or top management, there is a simple formula from which the training programme can proceed:

Following this formula five steps for analysing the training requirements may be set out:

Spot the operating or managing problems where training is required.

Analyse each problem to determine what part may be solved by training.

Trace this training need to groups of employees.

Determine the individual training needs within each group.

The most important step involves a synthesis of the training requirements of these individuals into a series of programmes wherein the training group members meet to receive common instruction.

Basic Concepts of Learning

Up to this point attention has been centred mainly on the supervisor's job and interest in training. A brief mention should be made of the learning processes which are fundamental to all training, which may be considered for convenience under two main headings:

The physical conditions and equipment which constitute the environment.

The trainer-trainee relationship, whether this is a two-person or a group relationship.

Regarding environment, two main points are emphasized. First the environment should be established to eliminate distracting influences as far as possible.

Attention can easily wander if something intrudes upon the pupil or teacher's concentration. Here are some of the distracting influences which are frequently found: noise—bad lighting and ventilation—excessive or inadequate heating—uncomfortable sitting posture—faulty placing of the trainee

in relation to the instructor—and interruptions from the outside.

Secondly, learning and retention will be aided if instruction is imparted through more than one of the senses. The understanding of a paper is enhanced by hearing a lecturer deliver it. A formula or process can be more easily grasped if it is presented visually. Special techniques can be "felt" and acquired if these are seen and practised in demonstration. Extensive development of visual aids in teaching and training has grown out of the fundamental soundness of this concept.

Taking the second main subject—learning relationships—there are four main concepts which require consideration.

The trainee needs to be well motivated if he is to learn effectively. There needs to be an incentive applicable to the goal or objective of the learning process which the pupil wishes to reach. This, of course, will vary in a wide variety of circumstances. The prospects of promotion or greater facility in one's job, or a higher rate of pay, or the prestige from being assigned to a new job or process, are effective incentives with which every one is familiar from his own experience.

People learn more effectively and lastingly if they know the relationship between what they are learning and the final results of their training. In other words there is greater confidence in the make-up and content of training if the ends to which it is directed are understood.

Attention and motivation are best maintained when a definite sense and knowledge of achievement is experienced at successive stages in the learning process. If the total to be learned or acquired can be subdivided and progress assessed at each stage, both teacher and pupil will feel that progress is being made, and the morale of this mutual relationship will be high.

At all times learning is an individual process. Each learns at his own pace, and this itself varies at different stages in the learning process. Groups should be kept small.

Benefits from Organized Training

The old school of management which put a man on the job to learn by trial and error would regard this approach of systematic training as just one more burden to an already overloaded day. Can the time and trouble which this approach involves be justified? Here are some achievements which speak for themselves:

Employees who feel that the management regards them as an asset worthy of development and a company career. An efficient and happy team who are on top of the job. The personal satisfaction and dignity resulting from a job well done. A versatile work-force to meet emergencies and to cover absences. A management confident in its ability to ensure smooth and efficient operations. Improved performance and increased productivity which result in improved standards of living.

Training is a Challenge

Training is a challenge, a challenge that can be expressed as follows: either problems are allowed to pile up, to be dealt with when they become too troublesome, or else the alternative of being on top of the job is adopted. From this position it is possible to look forward with the confidence of being able to tackle the problems which may arise, and with the courage to ask questions and to look ahead at future problems. If this attitude becomes widespread, at no stage in the organization will the growing process be impeded by lack of development of personnel at any level.

Future Programme

Esso's training programme will continue to include the following elements:

1. The best training staff and organization that can be provided;

2. A programme for improving trainers in the techniques of teaching;

3. An orientation course to acquaint all employees, especially new ones, with the company's history, objectives, organization, policies, benefit plans, working regulations, safety practices, etc.

4. On-the-job training so that every employee will know what his job is and how to perform it with reasonable success.

5. Basics of supervision for every supervisor outlining the skills and techniques of supervising.

6. Principles of management outlining the functions and techniques of management, with the full recognition that training and development at the top level is of prime importance.

The present training programme has been sound and successful, but it is only the beginning. Future programmes, with the benefit of experience and the full co-operation of employees, should bring closer the realization of the major objectives—a happy, efficient, and progressive team which avoids to-day's difficulties by solving to-morrow's problems.

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IRAQ PRODUCTION

June production of the Iraq Petroleum Co. and Associated Companies established a new record, being a total of 1,856,130 tons and nearly double the January figure of 961,540 tons. Details for the second quarter of the year, with the half year total, are:

	April tons	*May* tons	*June* tons	*Half year* tons
Kirkuk .	1,013,404	1,391,929	1,447,646	6,105,166
Zubair .	144,261	214,723	170,797	896,636
Qatar .	255,123	259,201	257,687	1,510,819
	1,412,788	1,865,853	1,876,130	8,512,621
Daily average	47,093	60,189	62,538	46,778

Details for the first quarter of the year are given on page 251 in the July issue.

1951 *Report*

The IPC has recently issued an attractive and well-produced brochure in which details of the 1951 activities of the three companies operating in Iraq (Iraq Petroleum Co., Basrah Petroleum Co., and Mosul Petroleum Co.) are reported and illustrated pictorially in colour and in monochrome and graphically.

The year 1951 was one of considerable developments. More than half of the Kirkuk-Banias pipeline was completed, the first cargo of oil from the Zubair field was shipped, and the new agreement with the Government of Iraq was negotiated. The booklet, as the managing director says in his foreword, is "a tribute to the unceasing efforts" of the personnel of all the companies.

The Iraq Pipeline

An interesting account of the Iraq pipelines written and illustrated by Victor Coverley-Price, appeared in *The Sphere* for 26 July.

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VENEZUELAN PRODUCTION

For the month of April 1952, Venezuelan oil production reached a daily average of 1,829,967 brl, an increase of 10,059 brl/day over March and 1,546 brl/day over February.

During the first four months of 1952, daily production averaged 1,822,349 brl, compared with a daily average production of 1,704,643 brl for the entire year 1951.

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Kuwait production: For the month of June 1952 production of crude in Kuwait amounted to 3,110,231 tons, total for the first half of 1952 being 18,225,018 tons.

SOUTH AMERICA'S LARGEST DIAMETER PIPELINE

After two years' planning and construction work, the largest diameter oil pipeline—30 inches—ever constructed in South America, is now in operation in Venezuela.

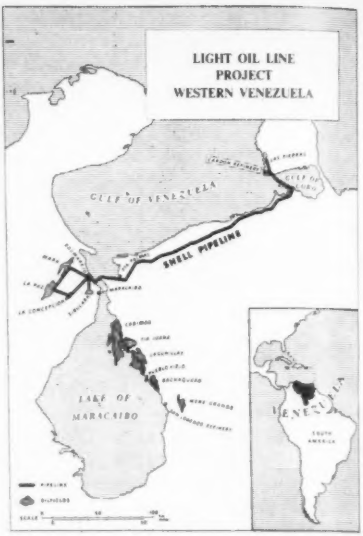
It extends from the main pumping-station at Palmarejo de Mara, to Shell's Cardon refinery and the Las Piedras terminal of the Mene Grande Oil Company some 160 miles to the north-east, on the Paraguana Peninsula. It is a joint venture of Shell, Texas, and Mene Grande.

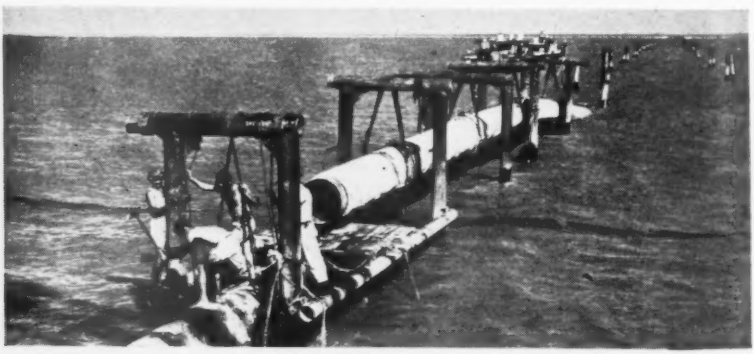
Although the distance covered by the line, which transports a relatively light-weight crude oil, is not great compared with some oil pipelines already operating in the U.S. and the Middle East, its construction was a major engineering feat by virtue of two deep water crossings involved—the Lake of Maracaibo and the Gulf of Coro. Planning and supervision of the construction of the line was carried out by technicians of the Shell Pipe Line Corporation.

For the five-mile crossing of Lake Maracaibo, two 20-inch diameter lines, laid parallel but 1000 ft apart, were used and the pipelines were buried in trenches 9 ft deep, dredged into the bed of the lake.

The pipe was first given a double coating of bitumen, reinforced with a double thickness of spun glass wrap, and welded into approximately 200-ft sections. The sections were then taken out by service barge to the main laying barge, which itself carried one day's supply of pipe aboard.

The main pipe-laying barge, 60 ft by 210 ft, was constructed from a Mulberry pierhead and provided a steady plat-





The line being laid across the Gulf of Coro.

form which enabled the technicians to work in the roughest weather. In the stern a chute was cut, through which the finished pipeline was launched. Some 500-700 ft of pipe was laid daily, some of it in a depth of more than 60 ft, and total working time to lay the two 20-inch lines was about 90 days.

Laying the pipe across the Gulf of Coro presented even greater problems because of wind, waves, and tide. Here a single 30-inch line, 19,800 ft long, was laid by pushing out the pipe from the northern shore without the need for trenching on the floor of the Gulf since there is no navigation in this water. Before laying, the pipe was protected by a 2½-inch thickness of reinforced Gunite laid over a double coating of bitumen and glass fibre wrap. The final length of 2200 ft of pipe was floated out to the opposite shore. The last tie-in weld connexions were made over the water from a welding stage, both ends lifted above the water by floating cranes. When the line was completed it was sunk to the floor of the Gulf by filling with water. Then it was further secured by laying concrete saddles at 25-ft centres over the pipe. These saddles were designed to counteract any buoyancy of the pipe should the oil be displaced by gas or air and provided greater resistance against a flowing tide.

An interesting feature of the work was the thin wall thickness of the pipe used generally on this line—5/6th to 3/8th inch for the main 30-inch land line; ½-inch and ¾-inch are used for the 30- and 20-inch pipe marine crossings respectively. The high strength, thin wall, large diameter pipe used for the land line gave a substantial saving in steel, transport, and welding, but involved special problems and required skill in handling, transport, and welding.

The above-ground section of the pipe covered a distance of 142 miles and consisted of a section, 121 miles long, from Punta Palmas, on the east shore of Lake Maracaibo, to the Gulf of Coro, and another section on the Paraguana Peninsula. Much of the route was through undeveloped country and it was therefore unnecessary to bury the pipe; it was laid throughout these two sections on concrete skids placed at 25-ft centres. For a short distance of some 4½ miles in more developed country near the city of Maracaibo the pipe was buried.

The pumping station at Palmarejo de Mara has a design capacity of 235,000 barrels daily, while the volumetric capacity of the complete length of pipeline is 705,000 barrels.

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TRINIDAD EXPLORATORY WELLS

In October of last year the Trinidad Development Co. announced the discovery of an Herrera sand in well Coora 188 which subsequently gave small but steady production. Further deep exploratory wells were put in hand to test the extent of the Herrera formation. Of these, the Company now state, two have been failures but the third, recently completed, is at present producing 260 brl/day from Herrera sand.

PURE AND APPLIED CHEMISTRY CONGRESS

Sweden will be the venue of next year's 13th International Congress of Pure and Applied Chemistry. The congress will include a physical chemistry section and a symposium on the chemistry of wood and wood constituents, both in Stockholm from 29 July to 4 August, and a symposium on macromolecules in Uppsala from 5-7 August. Preliminary application forms are obtainable from the Congress at Stockholm 70, Sweden.

AROUND THE BRANCHES

Scottish Branch members in front of the main administration building at Grangemouth refinery.

Scottish Branch

By the courtesy of Scottish Oils Ltd., 70 members of the Scottish Branch visited the newly extended oil refinery at Grangemouth on 26 June.

Mr Robert Crichton, managing director of the Company, made a short address of welcome, and Mr J. M. Caldwell, general manager, gave a short talk on the reasons for extending the refinery, the scheme of extension, a general description of the work involved in the extension, and its relation to the adjacent petroleum chemical plant operated by Petroleum Chemicals Ltd.

The party then proceeded to Lea Park Hotel, where Scottish Oils Ltd. had provided an excellent lunch. After lunch, the party was split up into groups under guides provided from the refinery staff. Much interest was taken by the members in the various phases of the refinery, which included jetties, tankage, distillation, blending and treating, the catalytic cracking unit in process of erection, the power and boiler plant—which incidentally serves in addition to refinery requirements, power and steam for Petroleum Chemicals Ltd. and the services area. The two imposing buildings in the Bo'ness Road, which accommodate the administrative staff and laboratories, also claimed much interest.

At the end of the tour, tea was served in the refinery. Colonel Potter, on behalf of the Branch, thanked the Company for the excellent day the party had enjoyed.

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ANNUAL REVIEWS, VOLUME 12

Just published is vol. 12 of the Institute of Petroleum's *Reviews of Petroleum Technology*. This volume deals in general with the year 1950 and practically all phases of the petroleum industry are covered, there being over 3300 references to articles which appeared in the literature during the period under review. Included in this volume are also a few reviews which cover the period 1949-50. These are on general geology and development, engine testing (both fuels and lubricants), furnace fuel oil, lubricants, and engines and automotive equipment, while in the case of refinery plant and engineering the period is 1948-50.

The 513 pages of this book, which include the subject and name indexes, contain a wealth of summarized information in a readily available form. Copies are obtainable from the Institute, the price being £2.10.0, members of the Institute having the privilege of purchasing one copy at £2.7.6 post free in each case.

HOW LITTLE WE KNOW*

By D. C. ION†

The pyramid of our knowledge of oil is an inverted pyramid. The higher we get from the fundamentals of crude oil the more we know. The great knowledge of chemists and engineers which allows the breaking down of crude oil by the many processes of distillation, cracking, and reforming into almost innumerable packets of oil to serve special purposes and the wealth of engineering knowledge then applied to their use, is indeed in great contrast to the lack of knowledge of crude oil before it enters an oil well.

I feel that the whole industry should take the keenest possible interest in the problems of the origin, migration, accumulation, and production of crude oil.

Origin

How was oil formed?

This question has puzzled men for many years and in the past century the number of men *actively* seeking an answer has grown into several thousands. World-wide research is being conducted on many different lines of thought. Even so we are still far from having an exact answer.

At the World Petroleum Congress last year three distinguished scientific workers presented papers discussing the results of their researches on botanical, bacteriological, and radioactivity lines. Each, while admitting that other agencies than the one they were personally investigating might help in the origin of oil, obviously thought that their own was the most important. Such convictions are indeed a stimulus to effort but from the point of view of the practical oil geologist whose object was to find oil, as yet only his ignorance had been increased.

These three examples were the summaries of years of research. They were published as generalizations and illustrate three of the many lines of research which are assisting the more orthodox organic chemist and geologist in their enquiry into the origin of oil. There are many other approaches to this problem.

How will more exact knowledge of the origin of oil affect the practical side of the industry?

Once it is known how oil was formed, exploration tools may be possibly augmented to direct the search to specific types of oil. Different types of exploration instruments may be necessary.

Refining may be revolutionized. Radioactive agents may displace normal catalytic cracking. On the other hand the "geomicrobiologist" may come into his own; as an analogy it might be noted that the commercial production of sulphur by bacteria has already been considered though found wanting.

A distinguished oil man recently said he considered an important blank in our knowledge was the relationship between oil and gas, even to the conundrum as to why in some gas/oil associations

*From a talk to the Oil Industries Club, 1 July 1952.

†Senior Geologist, Anglo-Iranian Oil Co.

there is most sulphur in the gas and little in the oil, and the reason.

Migration

How far can oil move underground? A short distance, a few miles, or a few hundred miles. Again no one knows; perhaps all are correct for different areas.

Examples of movement are many and obvious, but the mechanics of the flow is not understood. Is the effect of free gas the same underground under high pressure as it is in laboratory experiments? Is this action of free gas mainly effective during migration or when the gas is separating from the oil after accumulation? Is the tar mat found in some fields the remnant of an earlier migration to that which brought the present oil or is it a differentiation during migration or accumulation?

Lack of knowledge of the fundamental principles of the origin of oil has forced many people to try to explain the different types of oil by evoking recurrent migration. Loetgers tries to explain the variations of crude in the fields of Western Germany, others evoke the assistance of widespread gas migration in the Middle East. But in many ways these explain one unknown by another unknown.

The answers to such questions are still being sought and would obviously have an important influence on exploration and production.

Accumulation

Oil has been found in commercial quantities in reservoirs formed of most kinds of rock, from shales to serpentines. But the forecasting of the presence of favourable conditions for accumulation and of the limits of such conditions is still a great problem. This is where we call on the palæontologist, the "sedimentologist", and the palæogeographer. Studies of animals and rocks from present to very ancient are continuing with increasing vigour throughout the world and a bewildering volume of new terms is growing which often baffle rather than clarify the situation.

On the structural side there is a similar growth of baffling terms. Some now talk of paraliageosynclines, whatever that may mean, and two American characters have recently humorously suggested a classification of difficult structures by derivation from the word bloop, coining terms like bleep or double bloop, blob, blub or double blop, blimp, blump or double blimp and so on. Such terms have almost as much meaning as the bastard Græco-Latin terms some scientists use and the revolt against the clouding of meaning with high falutin terms is one with which I heartily agree.

Gone are the days of the simple anticlinal theory when rocks which were not obviously warped upwards were considered to have no hope of accumulating oil. Anyone who even glances at American oil trade journals will have noticed the terms stratigraphic traps, reefs, trends, to mention only a few and now the catchword is "basin play".

These I admit are a sign of our increasing knowledge but we still do not know sufficient about the principles underlying accumulation even to gauge with any precision the oil which has been found. Recently I have been studying the oil reserves of the world and I have been impressed how even the estimates as published of the proven reserves of the world's oil are liable to great variations mainly because we do not know sufficiently well how and why oil has accumulated.

If we cannot be accurate to within a few hundred million tons as to the oil we have found, how accurate can we expect to be as to the amount of oil which we have not yet found? Recently at the Institute of Petroleum Dr G. M. Lees and I stressed that the proving of reserves and the extraction of the oil depended mainly on the intensity of effort expended, itself dependent on economic and political factors. We

purposely did not attempt to say how much oil remained in the earth to be extracted, simply because sufficient is not yet known about the scientific principles behind the origin, migration, and accumulation of oil to make such estimates more than guesses.

Yet this question of the size and distribution of the ultimate reserves is a vital question to the whole oil industry. Our knowledge is increasing, every guess should be better than the last one and I do not say we know nothing, I merely stress that we know so little.

Production

In this side of the industry measurements are more easily made and are increasingly being made. A wealth of statistics is available but unfortunately there is a natural although dangerous tendency to theorize from laboratory measurements of relatively minute quantities.

As an example there are porosity determinations. The amount of oil in a reservoir and the amount that can be produced depends to a very large extent on the pore space in the rock. Cores can be taken and porosity determinations made which are used not for the cubic inches of the specimen but for the cubic miles of reservoir rock. If the specimen taken and the allowances made do not give a true average, estimate of reserves and maximum production efficiency rates may be very much in error, involving maybe millions of tons of oil.

The need is for more and more underground measurements. Yet no matter how precise the individual measurement, no matter how ingenious the method, the interpretation is the important part and is as yet dependent on very incomplete and tentative ideas.

As one example of the lack of knowledge can be cited the problem of the distribution of fissures in limestone and siltstone reservoirs—a problem which has exercised many minds in Persia for years. The same problem has cropped up in the limestone fields of Western Venezuela and in the U.S.A. in connexion with the so-called Spraberry Trend of West Texas, probably the largest single oil discovery in the U.S.A. for many years. What is the cause of the cracking and therefore what is the pattern of the cracks in which much of the oil lies and from which it can first be drawn? If the pattern were known not only would it be known where to drill to best advantage but the oil could be produced at the most efficient rate.

Great strides have been made in assisting nature to give up her oil by the various methods of secondary recovery but a measure of our ignorance can be gained from the fact that the API will not admit any addition by secondary recovery to the proved reserves of a field until thorough testing by a pilot plant or, better, after operation of an installed fluid injection procedure has actually demonstrated certainty of increased recovery. In other words the risks of failure are too high to warrant any theoretical assumption of efficiency.

Conclusion

That we know so little is not an admission of failure. I am not decrying, debunking, or criticizing the scientists who in innumerable ways are seeking to fill the gaps in our knowledge, to worry out the principles which lie beneath the whole structure of the oil industry. Rather am I saying that although we have learnt and are learning more and more it is not just in the general interest of the whole industry to learn more but in the *vital* interest of both producer and manufacturer to maintain an *active* interest, to assist in all possible ways and be ready to take advantage of the research into such unknowns as I have stressed.

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Laboratory Apparatus—The latest issue (16B-S) of Messrs Griffin & Tatlock's catalogue of laboratory specialities contains in particular details of fractionation apparatus.

PERSONAL NOTES

James A. Jameson, C.B.E., F.Inst.Pet., and **Frederick G. C. Morris** have resigned from the Board of AIOC. The resulting vacancies have been filled by **John M. Pattinson,** C.B.E., A.M.Inst.Pet., and **Harold E. Snow,** C.B.E.

F. Banks Warner, M.Inst.Pet., has been elected chairman and managing director of Fina Products Ltd., and **C. M. Merrick,** M.Inst.Pet., has been made a managing director of the company.

L. G. Packham, M.Inst.Pet., has been appointed Overseas General Manager to Messrs C. C. Wakefield & Co. Ltd., in succession to W. F. List. Mr Packham was previously manager of Overseas Division (Branches) and has been with the Company for 27 years.

John Ryan, C.B.E., M.C., has been elected chairman of the British Standards Institution in succession to Sir Roger Duncalfe. **The Rt. Hon. Viscount Waverley,** P.C., G.C.B., G.C.S.I., G.C.I.E., F.R.S., was re-elected President of BSI for the third year.

P. Spear, A.F.Inst.Pet., has been appointed director of research at the Research and Development Department of Rubery, Owen & Co. Ltd. He was formerly senior research assistant of the B.S.A. group machinability laboratory.

Dr Harold Lee Maxwell, recently appointed president of the ASTM for 1952-3, is supervisor of mechanical engineering consultants, E. I. du Pont de Nemours & Co. Inc.

New general manager of oil field sales of the National Supply Co. is **Thomas J. Walne,** formerly head of the Export Division. **A. R. Meyer** (*right*), new manager of the Export Division, was American representative of Oil Well Engineering Co. Ltd. 1946-9.

M. A. Katchourine, head of the Information Department of the Société Générale des Huiles de Pétrole BP, has been made a Chevalier of the Legion of Honour.

J. P. Dabell, A.M.Inst.Pet., has recently been appointed agricultural engineer, Food and Agricultural Organization (Irrigation and Drainage), United Nations Organization.

B. S. Duegan, F.Inst.Pet., senior scientific officer, Indian Ordnance Services, is at present in the United Kingdom studying petroleum technology in various petroleum institutions and laboratories. He is the first Indian national to be elected a Fellow of the Institute.

R. B. Sawrey-Cookson has been appointed to be head of the Press and BBC section of Esso's public relations department. He was formerly P.R.O. to the British Road Federation.

Ralph W. Gallagher, former president and chairman of Standard Oil Co. (New Jersey), died on 31 July at the age of 71. When he retired in December 1945 he had been with the Jersey Standard organization for 48 years.

On 31 July **Douglas Wilson** of the United Steel Companies Ltd. was appointed chairman of the Council of CBMPE in succession to E. F. E. Howard (Hayward-Tyler Ltd.) who had occupied that office for four years.

F. D. Tuemmler, head of Analytical Standardization Dept., Shell Development Co., was the recipient of an Award of Merit at 50th Anniversary Meeting of the ASTM. The award was for significant and valuable service, particularly in the work of Committee D-2 and in co-operation of that work with other ASTM committees.

Recently the Sultan of Brunei, in whose country is located the Commonwealth's largest single oilfield (Seria), visited Shell's Stanlow refinery. The photograph shows (left to right) *Haji Ibrahim Datu Perdana Mentri, O.B.E.* (the Sultan's private secretary), *D. H. Trumble* (State Treasurer), *P. J. P. Sumner* (British Council), *H.H. The Sultan, C. Hull* (assistant general manager, "Shell" Refining & Marketing Co. Ltd.), *C. R. Middleton* (refinery manager), *Pengiran Omar Ali* (the Sultan's brother-in-law), *and J. Berriman* (assistant refinery manager).

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VERMICULITE

In a monograph on vermiculite* prepared by the Colonial Geological Surveys it is stated that apart from its major use in thermal, acoustic and refractory insulating products, and in lightweight concrete, this substance is also usable in lubricants and as a substitute for graphite in so-called oil-less bearings.

Exfoliated vermiculite was examined in regard to its suitability for oil refining but it showed no decolorizing power. Other applications include its use as a sealing compound in oilwell drilling, as an inside lining in oil cracking units, as a catalyst substrate, and for dusting bituminous roofing felt.

*Vermiculite. By E. R. Varley. Colonial Geological Surveys. London: H.M.S.O., 1952. pp. 70+iv. 7s. 6d. net.

OIL AND NATURAL GAS DEVELOPMENT IN WESTERN CANADA

Alberta's oil potential has been so developed over the past five years as to place Canada as the fourth largest producer in the Western Hemisphere and the tenth in the world.

According to statistics prepared by the Petroleum and Natural Gas Division, Canadian Bank of Commerce, at the beginning of 1947 oil production was only 19,000 barrels daily, the Prairie Provinces being dependent for more than two-thirds of their needs on imports from the United States.

Reserves

At that time Western Canada's proved oil reserves were less than 100 million barrels. Today the proved reserves exceed 1,300 million barrels—an increase of some 1300 per cent. More complete evaluation of a string of recent discoveries plus expected new discoveries could raise the proved oil reserves to between the 1,500 and 2,000 million barrels level by the end of 1952. 95 per cent of the present reserves are located in Alberta, the chief region of exploration to date, with balance in the lightly-explored Northwest Territories, Saskatchewan, Manitoba, and British Columbia.

Natural gas reserves are being increased rapidly by discoveries in over 100 Alberta areas the past four years. The total proved gas reserves in Alberta are now variously estimated at between seven and twelve trillion cu. feet.

The gross worth of the various oil and gas reserves so far found is well over 4000 million dollars, and it should be recalled that Western Canada contains over 400,000 sq. miles of territory geologically favourable for oil and gas accumulation, less than five per cent of which has so far been fully evaluated by the oil seekers.

Exploration

Early in 1947 Western Canada had only twenty drilling rigs working. Today the number is 231, of which 100 rigs are drilling on exploratory locations and the rest developing known fields.

Exploration in which some 200 companies are concerned, at present spreads over 150 million acres in Western Canada, contrasted with active exploration on less than twenty million acres 4½ years ago. In all, probably over $700,000,000 of capital investment in Canada has been made since Leduc started the modern oil boom.

During 1951 there were 108 new discoveries of oil or gas, plus a lengthy list of important extensions to fields previously discovered. Oil strikes totalled forty, while natural gas was discovered in 68 new areas.

Alberta led the 1951 discovery parade with 98 finds, including 35 oil strikes and 63 gas discoveries. Saskatchewan, for several years a producer of heavy crude at Lloydminster, had two oil strikes and three gas finds. Manitoba provided its first oil, with two discoveries in the southwest corner of the province, while British Columbia had a gas discovery and its first oil strike, both in the north eastern section of the province.

Best single discovery of the year was Wizard Lake, a Devonian reef field expected to have major rating (oil reserves exceeding 100 million barrels), southwest of Leduc Field in central Alberta.

Alberta's year was also featured by (1) expansion of the Devonian reef region by discoveries extending up to 200 miles southeast and south of the Leduc-Redwater area, to Drumheller and to the Calgary area; (2) expansion

of the Peace River region into a major area of gas reserves; (3) increased importance of Cretaceous sands as oil and gas sources in south and central Alberta.

Production

In the spring of 1951 Alberta oil broke out of its Prairie Province confines, when the combination of the Edmonton-Great Lakes pipeline and lake tankers permitted deliveries to Ontario in large volume and in small volume to the mid-west United States.

Estimated oil production for 1951 in the Prairie Provinces exceeded 47,725,000 barrels, an increase of over 19,000,000 barrels on 1950 (recorded at 28,636,762 barrels). Canada was thus producing one-third of its own oil requirements. Of this 1951 total Alberta provided around 46,700,000 barrels (27,595,664 barrels in 1950); Saskatchewan 1,248,500 barrels (1,041,098 barrels in 1950); Manitoba several thousand barrels, its first production. The gross value in 1951 of Prairie Province oil production was estimated at $119,290,000.

New Fields

Among relatively unexplored areas which are regarded as showing future promise are the Northern Alberta Plains, stretching several hundreds of miles north of the Leduc-Redwater area, which may have great oil and gas prospects.

South and south east of the Leduc area, lie a string of Devonian and coral reef oil and gas discoveries made during the past two years. In this belt, it is considered, there is rich hope for the future.

The North West Territories, between Alberta and the Arctic Ocean, in which lies Western Canada's first Devonian reef oilfield, Norman Wells, is also thought to be a potentially great oil and gas region.

U.S. CARBON BLACK INDUSTRY

Production of carbon black in the U.S.A. in 1951 was 21 per cent higher than in 1950, the totals being 1,677,363,000 lb and 1,381,990,000 lb respectively. Total sales increased by 4 per cent. Details are:

	1950	1951
Number of plants	53	58
Production:	*(Thousand lb)*	
Contact process ...	616,765	645,881
Furnace process ...	765,226	1,031,482
	1,381,991	1,677,363
Sales:		
To rubber companies ...	1,030,368	1,061,229
To ink companies ...	50,903	45,496
To paint companies ...	11,139	11,366
Miscellaneous	16,661	11,554
Exports	399,568	433,493
	1,508,639	1,563,138
Value at plant	$84,604,000	$107,436,000
	(Million cu. ft.)	
Natural gas used ...	410,852	426,423
	(Thousand gal)	
Liquid hydrocarbons used	107,707	182,343

Average yields were: per 1000 cu. ft. of gas, 2.57 lb in 1950 and 2.67 lb in 1951; per gallon of liquid hydrocarbon, 3.02 lb in 1950 and 2.96 lb in 1951.

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SULPHUR FROM PETROLEUM IN CANADA

Officially opened on 10 June, the initial annual output of Canada's first sulphur-from-petroleum plant will be 10,000 tons. The plant is located at Jumping Pound, Alberta, as an ancillary to Shell's natural gas plant. The latter began production a year ago with a daily capacity of 25,000,000 cu. ft. of natural gas and is to be expanded by over one-third.

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CARDON REFINERY OPENED

The £8,000,000 lube oil plant at Cardon, largest installation of its kind in South America, was officially opened in June. Annual output is 100,000 tons.

During the next year it is planned to expand progressively the capacity from 5 to 8½ million tons per annum of crude.

PETROLEUM IN PARLIAMENT

The British Oil Industry

Speaking in the Committee Stage of the Civil Estimates and Supplementary Estimates 1952-53, Mr Geoffrey Lloyd, Minister of Fuel and Power, said on 7 July:

The oil industry is an immensely expanding trade, and the trade has doubled since before the war. By weight and value oil is the biggest single commodity moving in international trade outside the United States. British companies control or do nearly half of the international trade—last year about 80 to 90 million tons, in spite of Abadan. Of course, it means a considerable expenditure in foreign exchange to produce all this oil, but even in 1950 it was worth about £500 million, and this year, in spite of Abadan, it may be worth between £600 million and £700 million. It means, of course, very intense activity by the companies to keep up with this virile industry throughout the world, and, indeed, last year, the capital expenditure by them was in excess of £150 million.

Refineries are going up in the Commonwealth countries all round the Indian Ocean, and, of course, there is great expansion in home refining. Here there has been a great change in the outlook of the companies, because before the war they were very inclined to have the refineries in the countries of production. Owing to the great development of the chemical industry, based on petroleum products from the refineries, and also to the fact that these very large modern tankers of about 30,000 tons capacity have made the transport of crude oil about the world so much cheaper, there has been a move to have the refineries more in the countries of consumption.

Thus it is that, with the assistance of the Government, home refining, which was practically negligible before the war, has reached a rate of about 24 million tons this year, and it may be even 30 million tons next year. We may find, too, exports of about five million tons this year from refineries in the U.K., which, it is a little sad to reflect, is, in terms of coal equivalent, almost the amount to which we reduced our coal exports last year.

I think we ought not to leave the subject of oil without congratulating the companies on the remarkable successes of the measures they have taken to make up for the loss of Abadan. In doing that, we must pay also a tribute to the very great co-operation the U.K. has received from the United States oil companies.

Branded Petrol

In oral reply on 7 July the Minister of Fuel and Power said he was very anxious that the best qualities of petrol should once again be on sale in the U.K. as soon as possible, but would not take any step which would injure the country in its balance of payments in the present difficult situation.

Asked whether he was now able to make a statement on the introduction of branded petrol, the Minister of Fuel and Power (28 July) gave the written answer: No.

Oil Pollution (Committee)

In answer to a question (21 July), the Minister of Transport said he had decided to appoint a committee of representatives of the government departments concerned, the shipping industry and other interests to consider what practical measures can be taken to prevent oil pollution of coastal waters, and was arranging for surveyors to go aboard oil tankers adapted to prevent the escape of oil.

The Minister continued "the British Tanker Company, the Anglo-Saxon Petroleum Company and the Esso Transportation Company have decided to carry out experiments at their own expense in the near future to ascertain the drift of oil when discharged at sea. My Department has accepted an invitation to take part in these experiments which will, of course, be outside the 50-mile limit."

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OIL POLLUTION IN COASTAL WATERS

The experiments in the field of research in oil pollution in coastal waters, referred to in the House of Commons (see above) are to occupy about two months. Their object is to gain information on what happens to oil washings discharged at sea as part of tank-cleaning operations at distances of 50 miles and 100 miles from selected points respectively. A specially chartered yacht *Gay Caprice* (134 tons gross) is to make a series of voyages each of several days, following patches of oil discharged by shipping. The British Tanker Co's representative on board is Capt. D. J. Hurst, who is accompanied by D. F. Duckworth, an assistant chemist at AIOC's research station at Sunbury.

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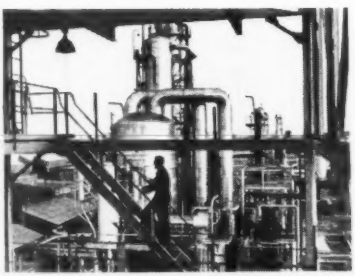

NEW ANTWERP REFINERY

The refinery by night.

The new 2-million ton refinery at Antwerp was formally opened by the Belgian Prime Minister, M. Van Houtte on 23 June. Built jointly by Compagnie Financière Belge des Pétroles and AIOC, who formed the Société Industrielle Belge des Pétroles for this project, the refinery is estimated to have cost about £10,000,000.

Situated on the right bank of the Escault, south of the Kruisschans lock, the installations cover more than 370 acres. The site is some five miles below Antwerp, at a point where the dock system communicates with the river. To raise the level of the ground by 15 ft so as to bring it above that of the Escault at high tide, it was necessary to bring to the site 5 million cu. yards of hydraulic fill. Other materials used in the undertaking included 25,000 cu. yards of concrete and 25,000 tons of steel.

Production began in October of last year and the 1951 output was 318,000 tons. A figure of 1,500,000 tons is given as the estimated 1952 production, of which the greater part will be shipped by barge to the Benelux countries.

(Left) *A mid level view of No. 2 distillation unit at Antwerp.*

COURSES IN PETROLEUM TECHNOLOGY

The 1952-3 course of lectures on the general technology of petroleum at the Sir John Cass College commences on 2 October at 3.30 p.m. and continues on Thursdays until 19 March. During the course there will be visits to Fawley refinery in December and to Shell Haven or Llandarcy on 26 March. Brief details of the lectures, which last about an hour each, are:

Introduction. Origin of petroleum and types of hydrocarbon. Types of products. 2 Oct.

Discovery and production. 9 Oct.

Distillation and fractionation. 16 Oct.

Combustion. Uses and properties of gases and natural gasoline. 23 Oct.

Principle of spark ignition engine. Knocking and its measurement. 30 Oct.

Testing of gasoline. 6 Nov.

Production of gasoline. 13 Nov.

Uses, testing, and manufacture of kerosines and S.B.P. spirits. 20 Nov.

Principle of C.I. engine and its fuel requirements. 27 Nov.

Fuel oils and their applications. 8 Jan.

Applications of bituminous products, testing, and manufacture. 15 Jan.

Function and applications of lubricants. 22 Jan.

Testing and manufacture of lubricants. 29 Jan.

Development of lubricants. 5 Feb.

Application, testing, and manufacture of greases. 12 Feb.

Paraffin wax refining and applications. 19 Feb.

Special products. Chemicals. 26 Feb.

Bulk oil storage. 5 March.

Measurement and transport. 12 March.

Research and development. 19 March.

Lecturers are E. J. Boorman, B.Sc., Ph.D., D.I.C., F.R.I.C., F.Inst.Pet., P. F. Ellis, B.Sc., A.R.I.C., M.Inst.Pet., and L. W. G. Firmin, B.Sc. Fee for the course is 30/- and enrolment forms are obtainable from the Principal of the College, Jewry Street, London, E.C.3.

Heat Transfer

Commencing on Friday, 10 October, at 6.30 p.m. J. M. Coulson, M.A., Ph.D., A.M.I.Chem.E., is giving a series of eight lectures at the Sir John Cass College on heat transfer in chemical plant. The course is intended for industrial chemists and chemical engineers and the fee is £1.

Power from Petroleum

A course of six lectures on the production of power from petroleum will be given at 6.30 p.m. on Thursday evenings beginning on 23 October. Lecturer is W. S. Ault, B.A., F.Inst.Pet., and details are available from the Sir John Cass College.

Distillation Course

A course of eight lectures by G. A. Dummett, M.A., A.M.I.Chem.E., on distillation commences at the Sir John Cass College on 16 January at 6 p.m. and continues on Friday evenings. The course covers theory, plant design, and processes, and the fee is £1.

Marine Fuels and Lubricants

Eight lectures on petroleum fuels and lubricants will be given at the Sir John Cass College from 22 January on Thursday at 6.30 p.m. They will provide an introductory technical background for those concerned with the sale and use of these products.

Instrumentation and Process Control

A series of courses intended to introduce engineers, physicists, chemists, and others to the possibilities of process control are being held at Battersea Polytechnic. They are:

Measurement. Temperature (2, 9, 16, 23 Oct); Pressure (30 Oct); Level (6 Nov); Flow (13, 20, 27 Nov); Valve sizing (4, 11, Dec). Fee for course 27/6d.

Mathematics of Feedback Control. Eight lectures, 13 Oct to 1 Dec. Fee £1.

Control. Twelve lectures on theory and application of automatic process control, 15 Jan to 2 April. Fee £1 10s.

*Control Application. p*H (26 Jan, 2 Feb); Humidity (9, 15 Feb); Viscosity (23 Feb, 2 March); Conductivity (9, 16 March). Fees, 5/- per subject.

Details and application forms are available from Electrical Engineering Dept., Battersea Polytechnic, Battersea Park Road, London, S.W.11.

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CAT CRACKER FOR BELGIUM

A Houdriflow catalytic cracking unit of 3600 brl/day capacity is to be installed in the Antwerp refinery of Albatros S.A. Belge pour le Raffinage de Pétrole. Projected modernizations of this refinery call for a feed preparation unit, a polymerization plant, and new treating units for gasolines. Consultants to Albatros are Petrocarbon Ltd. and the mechanical engineering work is being handled by Head Wrightson Processes Ltd.

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CANADIAN OIL

A 60-page booklet on "Canadian Oil—A Century of Progress," recently been issued by the Shell Oil Company of Canada Ltd., reprints a series of articles first published in *Shell News*, the Company's employee magazine.

It opens with a description of the first Canadian oilfield—Lambton County, Ontario. The succeeding chapters deal particularly with developments in Alberta and an account of pipeline facilities.

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The API—Recently the American Petroleum Institute has published a booklet showing "What it is" and "What it does". A chart of the organization is included and copies are obtainable from the API at 50 West 50th Street, New York 20, N.Y., U.S.A.

FORTHCOMING MEETINGS

THE INSTITUTE

Methods of Atomizing Liquid Fuels. J. R. Joyce (*Thornton Research Centre, Shell Petroleum Co. Ltd.*). At 26 Portland Place, London, W.1, 5.30 p.m. (*tea* 5 *p.m.*), 8 October.

Distribution of Petroleum in the U.K. The Changing Pattern. T. W. Mathias, M.A. (*Shell-Mex & B.P. Ltd.*). At 26 Portland Place, London, W.1, 5.30 p.m. (*tea* 5 *p.m.*), 22 October.

Sulphur Compounds in Petroleum. S. F. Birch, Ph.D., A.R.C.S., D.I.C. (*Sunbury Research Station, Anglo-Iranian Oil Co. Ltd.*). At 26 Portland Place, London, W.1, 5.30 p.m. (*tea* 5 *p.m.*), 12 November.

London Branch

The Automobile—Today, Tomorrow. E. B. V. Potter, B.Sc., M.S. (*Esso Development Co. Ltd.*). At 26 Portland Place, London, W.1. 6.0 p.m. (*tea* 5.30 *p.m.*). 24 September.

Stanlow Branch

The Kirkuk-Banias Pipeline. H. S. Gibson, C.B.E., M.A., M.I.Mech.E. (*Iraq Petroleum Co. Ltd.*). At Grosvenor Hotel, Chester, 7.30 p.m. 15 October.

Modern Methods of Motor Gasoline Manufacture. K. Owen, M.Sc. At Empire Café, Morecambe, 8.30 p.m. 23 October.

Soaring Flight. W. E. Crease. Joint meeting with Royal Aeronautical Society. At Grosvenor Hotel, Chester, 7.30 p.m. November 18.

OTHER SOCIETIES

Diesel Digestion. Presidential Address by G. B. Fox. Diesel Engine Users Assoc. At Caxton Hall, London, S.W.1., 2.30 p.m. 16 October.

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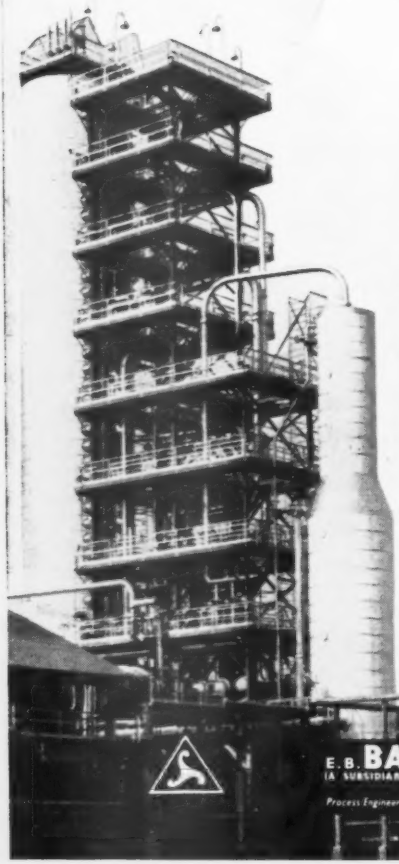

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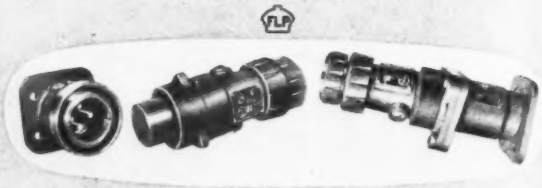

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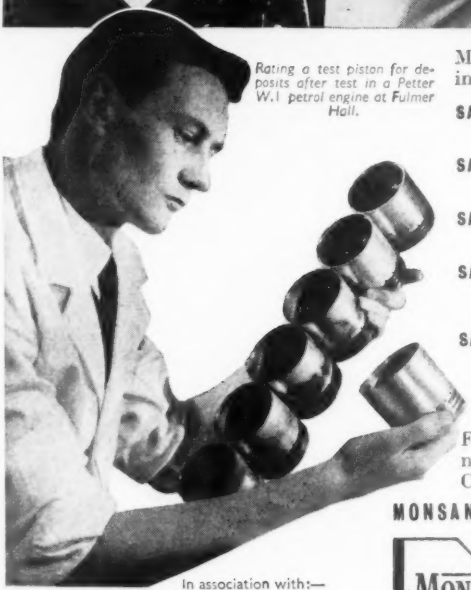

Rating a test piston for deposits after test in a Petter W.1 petrol engine at Fulmer Hall.

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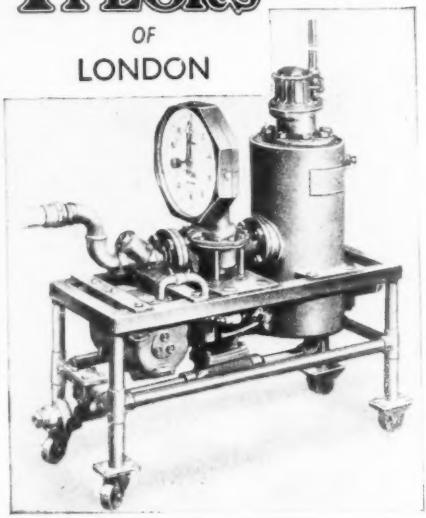

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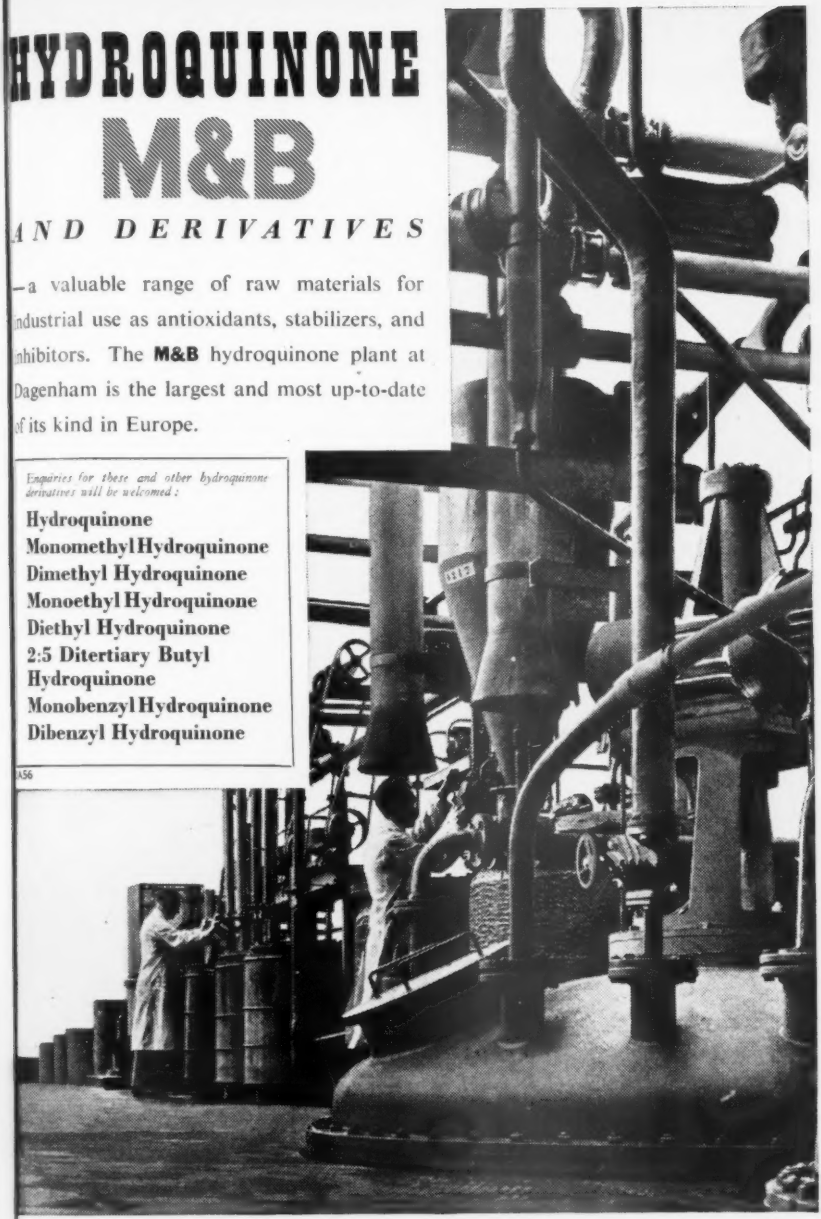

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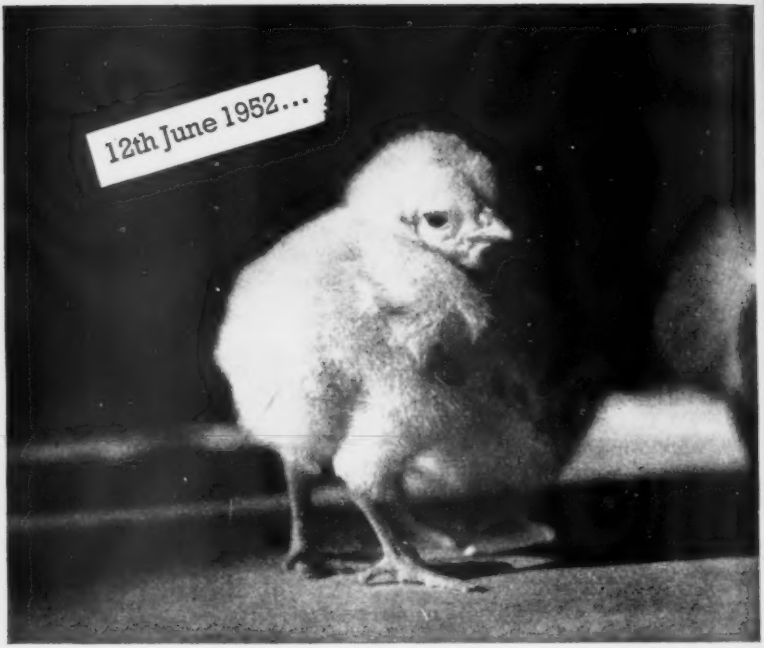

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